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| 10/657,107 | 09/09/2003 | Yasushi Sasa | 65326-029 | 9832 |

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| EXAMINER | |
|---|---|
| LIEW, ALEX KOK SOON | |
| ART UNIT | PAPER NUMBER |
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/657,107 | SASA ET AL. | |
| | Examiner | Art Unit | |
| | Alex Liew | 2624 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *16 November 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1,2,5-7,10-14,17-19,21,22 and 24-33* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,5-7,10-14,17-19,21,22,24-33* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

This action is in response to the RCE filed on 11/16/07.

**Response to Applicant's Argument**

On page 14, the applicant stated:

... Thus, Bamberger is directed towards adjusting grey level differences between adjacent pixels in a single image.

Thus, Bamberger does not set a "specified pixel value range which is positioned between representative pixel values of two regions in said inspection image and/or said reference image, said two regions corresponding to two kinds of regions on said object," ...

The applicant further argues the combination of Tanaka and Bamberger does not disclose the claimed invention of claim 1. The examiner agrees with the applicant. However, in an updated search the examiner found Okubo (US pat no 5,600,734); Okubo reads on

an image pickup device for performing an image pickup of an object to acquire data of an inspection image which is multitone (see figure 2, 122 is the image input device and figure 5A and 5B shows image of a bitone image with black and white pixel values);

a memory for storing data of a reference image (see figure 1, element 104);

an operation part for performing the steps of:

setting a specified pixel value range which is positioned between representative pixel values of two regions in said inspection images and/or said reference image, said two regions corresponding to two kinds of regions on said object (see figure 36C, the region where the blur occurs is read as the setting

specified pixel, the blur in an image normally occurs on the edges of the image and edge values will cross over to none edge such as the background of the image);

obtaining coefficients to enhance a difference between arbitrary pixel values other than said specified pixel value range relative to a difference between arbitrary pixel values other than said specified value range (see figure 35, step eight beta is the coefficient); and

obtaining an enhanced differential image between said inspection image and said reference on the basis of said transfer characteristics (see figure 35, step 7 then edge is multiply by weight factors in step 8, wherein this multiplication of the edge data and weights is read as edge data enhancement).

Okubo discloses aligning plurality of semiconductor layers (see column 1, lines 37 to 41), but do not inspecting semiconductor layers for defects. Tanaka discloses inspecting semiconductor images by taking the difference between an inspection image and a reference image (see figure 3). One skilled in the art would include inspecting a semiconductor image because to find defects and allowing the operator to rework the electronic component to improve quality of the electronic component being manufactured.

Okubo and Tanaka do not disclose obtaining a transfer characteristic.

Bamberger discloses obtaining transfer characteristics to enhance spot pixel values other than said specified pixel value range relative to a difference between arbitrary pixel values other than said specified value range (see figure 3G, wherein specified

pixels are read as the background pixel and the enhanced pixels are read as the arbitrary pixel). One skilled in the art would include a transfer characteristic because to avoid using mathematical operations to enhance pixel values in order to save time and processing power; a transfer characteristic takes input pixel values and output new pixel values by using a look up table.

The examiner will make new grounds of rejection using Okubo in view of Tanaka.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 2, 6, 10 – 14, 18, 21, 22 and 24 – 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okubo (US pat no 5,600,734) in view of Tanaka (US pat no 7,116,816) and Bamberger ((US pat no 5,946,407).

With regards to claim 1, Okubo reads on

an image pickup device for performing an image pickup of an object to acquire data of an inspection image which is multitone (see figure 2, 122 is the image input

device and figure 5A and 5B shows image of a bitone image with black and white pixel values);

a memory for storing data of a reference image (see figure 1, element 104);

an operation part for performing the steps of:

setting a specified pixel value range which is positioned between representative pixel values of two regions in said inspection images and/or said reference image, said two regions corresponding to two kinds of regions on said object (see figure 36C, the region where the blur occurs is read as the setting specified pixel, the blur in an image normally occurs on the edges of the image and edge values will cross over to none edge such as the background of the image);

obtaining coefficients to enhance a difference between arbitrary pixel values other than said specified pixel value range relative to a difference between arbitrary pixel values other than said specified value range (see figure 35, step eight beta is the coefficient); and

obtaining an enhanced differential image between said inspection image and said reference on the basis of said transfer characteristics (see figure 35, step 7 then edge is multiply by weight factors in step 8,, wherein this multiplication of the edge data and weights is read as edge data enhancement).

Okubo discloses aligning plurality of semiconductor layers (see column 1, lines 37 to 41), but do not inspecting semiconductor layers for defects. Tanaka discloses inspecting semiconductor images by taking the difference between an inspection image and a

reference image (see figure 3). One skilled in the art would include inspecting a semiconductor image because to find defects and allowing the operator to rework the electronic component to improve quality of the electronic component being manufactured.

Okubo and Tanaka do not disclose obtaining a transfer characteristic.

Bamberger discloses obtaining transfer characteristics to enhance spot pixel values other than said specified pixel value range relative to a difference between arbitrary pixel values other than said specified value range (see figure 3G, wherein specified pixels are read as the background pixel and the enhanced pixels are read as the arbitrary pixel). One skilled in the art would include a transfer characteristic because to avoid using mathematical operations to enhance pixel values in order to save time and processing power; a transfer characteristic takes input pixel values and output new pixel values by using a look up table.

With regards to claims 6, 13, 18 and 24, see the rationale and rejection for claim 1.

With regards to claim 2, Okubo and Tanaka disclose all the limitations of claim 1; Tanaka discloses inspection image and reference image (figure 3), but do not discloses using transfer characteristic. Bamberger discloses transfer characteristic (see figure 3E-G). See motivation of claim 1.

With regards to claim 10, see the arguments presented in claim 2. To reiterate from claim 2, by adding an addition image enhancing process, enhancing input and reference image, before alignment process, one will achieve enhanced brightness of the image (shown in Bamberger figure 4B to C, brightness is adjusted through changing the curvature output of the look up table), so the operator will take more notice of the defects after performing the difference image.

With regards to claim 11, Tanaka discloses an operation part synthesizes a differential image between said inspection image and said reference image and said differential image and compares values of pixels in a synthesized image with a predetermined threshold value to perform inspection (see figure 3, the threshold is specified at 25, th, the position of the pixel values which exceeds the threshold value are noted at 26).

With regards to claim 12, Okubo and Tanaka discloses all of the claim elements / features as discussed above in rejection for claim 1 and incorporated herein by reference, but fails to disclose dividing image acquired by said image pickup part. Bamberger discloses each of a plurality of images, which are obtained by dividing an image acquired by said image pickup part is said input image (see figure 4B to D, shows regions where there is a chance it is a cancer tumor region, those cancer tumor regions are read as defects in an inspection electronic part because it is brighter than the rest of the image, only a divided section of the image is taken and enhance by a look up table shown in figure 4D, the images being examine are input images, see

figure 1, 10). It would have been obvious to one having ordinary skill in the art at the time of the invention was made to include dividing image acquired by said image pickup part because to avoid increasing the brightness of the entire image causing the brightness of noise pixels to be enhance, which will negatively effect the results of the defect detection system.

With regards to claim 14, see the rationale and rejection for claim 2.

With regards to claim 21, see the rationale and rejection for claim 10.

With regards to claim 22, see the rationale and rejection for claim 11.

With regards to claim 25, Bamberger discloses transfer characteristics are obtained in the form of two-dimensional look-up table, and said enhanced image is obtained by using said two-dimensional look-up table (see figure 3E to 3G). Tanaka discloses computing differential image (see figure 3). See motivation for claim 1.

With regards to claim 26, the combination of Tanaka and Bamberger disclose transfer characteristic include inspection image transfer characteristics from said inspection image and reference image transfer characteristics obtained from said reference image (Tanaka discloses inspection image and reference image, figure 3; Bamberger discloses transfer characteristic, figure 3E).

With regards to claim 27, Tanaka discloses operation part synthesizes a differential image between said inspection image and said reference image and said differential image and compares values of pixels in a synthesized image with a predetermined threshold value, to perform inspection (see figure 3, threshold margin measure location of defect in the difference image). Bamberger discloses enhanced image. See motivation for claim 1.

With regards to claim 28, see the rationale and rejection for claim 12.

With regards to claims 29, 30 and 33, see the rationale and rejection for claim 25.

With regards to claim 31, see the rationale and rejection for claim 26.

With regards to claim 32, see the rationale and rejection for claim 27.

3. Claims 5 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okubo ('734) in view of Tanaka ('816) and Bamberger ('407) as applied to claim 1 further in view of Djakovic (US pat no 5,875,267).

With regards to claim 5, Okubo, Tanaka and Bamberger disclose all the limitations of claim 1, but do not explicitly mention said representative pixel values are average values of values of pixels belonging to said two regions, respectively. In Djakovic, a blur is computed using the average of a current pixel and its surrounding neighboring pixels (see column 5, lines 14 to 19). One skilled in the art would include representative pixel value being average of two adjacent region because to determine the level of blur in the image, to allow an operator to create an appropriate edge to eliminate the blur improving image quality.

With regards to claim 17, see the rationale and rejection for claim 5.

4. Claims 7 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okubo ('734) in view of Tanaka ('816) and Bamberger ('407) as applied to claim 6 further in view of De Gasperi (US pat no 4,433,385).

With regards to claim 7, Okubo, Tanaka and Bamberger disclose all of the claim elements / features as discussed above in rejection for claim 6 and incorporated herein by reference, but fails to disclose calculating standard deviation within specified area. Bamberger calculates the average value of the specific pixel values (see col. 12 lines 1 – 3), but does not further calculate the standard deviation of the specific pixel values. De Gasperi discloses pixel value range corresponding to said specific region is set on the basis of a standard deviation of values of pixels belonging to said specific region

(see col. 5 lines 15 to 35, device calculates the standard deviation of a 16-dotted area). It would have been obvious to one having ordinary skill in the art at the time of the invention was made to include calculating standard deviation within specified area because the standard deviation finds areas, which are uniformly distributed (see De Gasperi col. 6 lines 55 – 60), in the case of defects, one will be able to obtain the type of defects by calculating the standard deviation to see whether the defect is uniform or if it is not uniform (eg. half of the defect area is deeper than the other half), then one will be able to classified or recognize the type defect present on the electronic device to select the proper procedure to correct the defect on the electronic part.

With regards to claim 19, see the rationale and rejection for claim 7.

**Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alex Liew whose telephone number is (571)272-8623. The examiner can normally be reached on 9:30AM - 7:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Bella can be reached on (571) 272-7778. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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